

STEM Program



RC Toys

Electromagnetic Waves

Design an experiment to learn about how electromagnetic waves power remote controlled toys and what can get in their way.

Suited to Section



Joey Scouts



Cub Scouts



Scouts



Venturer Scouts



Rover Scouts

Key SPICES Growth



SOCIAL



PHYSICAL



INTELLECTUAL



CHARACTER



EMOTIONAL



SPIRITUAL

Challenge Area



COMMUNITY



PERSONAL GROWTH



OUTDOORS



CREATIVE

Likely Scout Method Elements



COMMUNITY INVOLVEMENT



LEARNING BY DOING



NATURE AND THE OUTDOORS



PATROL SYSTEM



PERSONAL PROGRESSION



PROMISE AND LAW



SYMBOLIC FRAMEWORK



YOUTH LEADING, ADULTS SUPPORTING

STEM Program

RC Toys



Plan

Remote controlled toys such as vehicles or dinosaurs use radio waves to transmit signals from the controller to the toy. The radio waves, a form of electromagnetic radiation, carry information in the form of binary codes which the toys can then use as a set of instructions for operation. The controller will transmit signals on a specific frequency selected to minimise the change of interference from other radio signals such as Wi-Fi or phone signals.

Some materials can act as shields to electromagnetic radiation. The effectiveness of the shield can be impacted by factors such as the conductivity, thickness and permeability of the material.

Your challenge is to design an experiment testing the effectiveness of different materials in shielding the radio waves produced by a remote controlled toy. You should consider the following when designing your experiment:

1. Do some background research into what materials are best at blocking electromagnetic radiation.
2. Decide what type of materials you want to test.
3. How will you use your material to block the radiation? Consider focusing on blocking the antenna on the transmitter.
4. How many layers of the material will you use?
5. What will you measure to test the effectiveness of the shield? Can you measure the distance that the signal transmits under different conditions?.

Review

1. Look back at your predictions and check if they match your results. What have you learned from your experiment? Do you think you could improve your experimental design if you were going to repeat this experiment?

Do

1. Conduct your experiment and keep a record of your results. You might want to set up a results table to record any measurements and take some images of how the experiment was set up.

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Variations

- Make this into a patrol game or competition. After investigating the properties of different materials with this experiment, build a protective barrier to stop other patrols infiltrating your base with their RC vehicles.
- Remote controls for TVs work on a similar principle as remote controlled toys, but using shorter wavelength infrared radiation instead. You could investigate how the transmission of these waves compares to the radio waves from the first part of the experiment.

Safety Tips

- Follow the safety instructions provided with any RC products you are using.
- Be sure to keep batteries secure away from animals and young children and follow protocols for safe disposal.

SciScouts Physics of Waves

The SciScouts Physics of Waves is a National Science Week project, undertaken in collaboration with Fizzics Education. These instructions were prepared by Scouts for Scouts. This National Science Week project is supported by the Australian Government.

Scouting has always been strong on STEM skills. Maths to calculate catering quantities and navigate, the science of water purification, the physics of abseiling, and the engineering of pioneering structures – they all have their place. In the current program for our youth members, STEM and Innovation forms one of six Special Interest Areas that enable Scouts to set goals and pursue their own ideas.

